PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

To:
MICHAEL DAVID
FRIED FRANK HARRIS SHRIVER & JACOBSON
1001 PENNSYLVANIA AVENUE, N.W.
SUITE 800
WASHINGTON, DC 20004-2505

PCT

NOTIFICATION OF TRANSMITTAL OF INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Rule 71.1)

Date of Mailing *(day/month/year)*	26 MAY 2004

Applicant's or agent's file reference	IMPORTANT NOTIFICATION
94756/3	

International application No.	International filing date *(day/month/year)*	Priority date *(day/month/year)*
PCT/US01/50502	28 December 2001 (28.12.2001)	

Applicant

INTER AMERICAN UNIVERSITY OF PUERTO RICO

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.

2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.

3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. **REMINDER**

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices)(Article 39(1))(see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/US	Authorized officer
Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450	Patricia Leith
Facsimile No. (703) 305-3230	Telephone No. (571) 272-1600

Form PCT/IPEA/416 (July 1992)

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 94756/3	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/US01/50502	International filing date *(day/month/year)* 28 December 2001 (28.12.2001)	Priority date *(day/month/year)*
International Patent Classification (IPC) or national classification and IPC IPC(7): A61K 35/78 and US Cl.: 424/725 514/783		
Applicant INTER AMERICAN UNIVERSITY OF PUERTO RICO		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 6 sheets, including this cover sheet.

   ☒ This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

   These annexes consist of a total of 8 sheets.

3. This report contains indications relating to the following items:

   - I ☒ Basis of the report
   - II ☐ Priority
   - III ☐ Non-establishment of report with regard to novelty, inventive step and industrial applicability
   - IV ☐ Lack of unity of invention
   - V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
   - VI ☐ Certain documents cited
   - VII ☐ Certain defects in the international application
   - VIII ☐ Certain observations on the international application

Date of submission of the demand	Date of completion of this report
23 June 2003 (23.06.2003)	27 April 2004 (27.04.2004)
Name and mailing address of the IPEA/US Mail Stop PCT, Attn: IPEA/US Commissioner for Patents P.O. Box 1450 Alexandria, Virginia 22313-1450 Facsimile No. (703) 305-3230	Authorized officer Patricia Leith Telephone No. (571) 272-1600

Form PCT/IPEA/409 (cover sheet)(July 1998)

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US01/50[redacted]

I. Basis of the report

1. With regard to the elements of the international application:*

☐ the international application as originally filed.

☒ the description:
pages 1, 2, 5-7, 9-13, 15-22 and 24 as originally filed
pages 3, 4, 8, 14 and 23, filed with the demand
pages NONE, filed with the letter of _____.

☒ the claims:
pages NONE, as originally filed
pages NONE, as amended (together with any statement) under Article 19
pages NONE, filed with the demand
pages 25-27, filed with the letter of 22 April 2004 (22.04.2004).

☒ the drawings:
pages 1-3, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____.

☐ the sequence listing part of the description:
pages NONE, as originally filed
pages NONE, filed with the demand
pages NONE, filed with the letter of _____.

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.
These elements were available or furnished to this Authority in the following language _____ which is:

☐ the language of a translation furnished for the purposes of international search (under Rule23.1(b)).

☐ the language of publication of the international application (under Rule 48.3(b)).

☐ the language of the translation furnished for the purposes of international preliminary examination(under Rules 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

☐ contained in the international application in printed form.

☐ filed together with the international application in computer readable form.

☐ furnished subsequently to this Authority in written form.

☐ furnished subsequently to this Authority in computer readable form.

☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.

☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. ☐ The amendments have resulted in the cancellation of:

☐ the description, pages NONE

☐ the claims, Nos. NONE

☐ the drawings, sheets/~~fig~~ NONE

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).**

** Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).*
*** Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.*

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No.
PCT/US01/50502

V. Reasoned statement under Rule 66.2(a)(ii) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. STATEMENT

Novelty (N)	Claims	2, 4-8, 10-11, 14-18 and 19-29	YES
	Claims	1, 3, 9, 12 and 13	NO
Inventive Step (IS)	Claims	2, 4-8, 10-11, 14-18 and 19-29	YES
	Claims	1, 3, 9, 12 and 13	NO
Industrial Applicability (IA)	Claims	1-29	YES
	Claims	NONE	NO

2. CITATIONS AND EXPLANATIONS
Please See Continuation Sheet

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

V. 2. Citations and Explanations:
Claims 1 and 3 lack novelty under PCT Article 33(2) as being anticipated by Amelio Mauro et al. (1998).

Amelio Mauro et al. (1998) disclosed stigmasta-3,5-diene and therefore anticipated these claims (Biosis Abstract).

Arguments are made that Amelio Mauro et al. did not teach stigmasta-3,5-diene in a carrier, however Amelio Mauro et al. taught that stigmasta-3,5-diene is indigenous to olive oil. Olive oil is considered a pharmacutical carrier. Arguments are made that Amelio Mauro et al. did not teach a medicinal use for stigmasta-3,5-diene, however the claims are drawn to compositions. Stigmasta-3,5-diene in a carrier (olive oil) was known and therefore does not constitute a novel inventive concept. Arguments state that the Written Opinion stated that these claims were obvious but did not provide reasoning. If a claim lacks novelty under PCT Article 33(2), it automatically lacks an inventive concept under PCT Article 33(3) without further explanation. If a claim lacks novelty, it also lacks an inventive concept.

Claims 9, 10 and 13-lack novelty under PCT Article 33(2) as being anticipated by Morris et al. (1979).

Morris et al. taught benzyl salicylate in combination with agar (carrier) for combating microorganisms thereby anticipating the claims.

Arguments were made with regard to claim 12 which states 'galaxolide' and not benzyl salicylate. This inadvertant error has been corrected. Claim 10 is anticipated by Morris et al., while claim 12 is not.
Arguments are made which indicate that benzyl salicylate was tested, but not taught by Morris et al. to be a preferred embodiment. However, the compositions were none-the-less known and therefore anticipated, regardless of weather or not Morris et al. specifically taught these compositions as prefered embodiments. Again, these are composition claims and the recitation of the 'use' of these claims do not attribute the claims novelty over the art.

Claims 9 and 12 lack novelty under PCT Article 33(2) as being anticipated by Unilever, N.V. (EP 0 499 304 A).

Unilever, N.V. disclosed a composition comprising benzyl salicylate and galaxolide (page 9).

Arguments are made that indicate that Unilever used venzyl salicylate and galaxolide merely as fragrance componentnts and do not describe any medicinal efficacy in relation to these compounds. Again, these are composition claims. The compositions are known and therefore do not contribute any novelty over the art. The intended use for these compounds does not materially change the structure and function of the compounds, nor the structure and function of their combination into a composition. Therefore, the claims remain anticipated.

Supplemental Box
(To be used when the space in any of the preceding boxes is not sufficient)

Claims 2, 4-8, 10-11, 14-18 and 19-29 meet the criteria set out in PCT Article 33(2) and (3), because the prior art does not teach or fairly suggest the specific limitations in these claims.

Claims 1-29 meet the criteria set out in PCT Article 33(4), and thus have industrial applicability because the subject matter claimed can be made or used in industry.

SUMMARY OF THE INVENTION

In one aspect, the invention provides a pharmaceutical composition comprising a pharmaceutical carrier and at least one compound selected from the group consisting of cobaltocene-octomet and stigmastan-3,5,-diene. In accordance with a preferred embodiment, the composition comprises cobaltocene-octomet, stigmastan-3,5,-diene, and friedelin. In accordance with another preferred embodiment, the composition further comprises at least one compound selected from the group consisting of α-caryophylene, β-caryophylene, caryophylene oxide, cyclododecane, acetic acid, and a terpene.

Also provided is a pharmaceutical composition comprising a pharmaceutical carrier and at least one compound selected from the group consisting of galoxolide, benzyl salicylate, eucalyptol, and α-pinene. In accordance with a preferred embodiment, the pharmaceutical composition comprises galoxolide, benzyl salicylate, eucalyptol, and α-pinene. In accordance with another preferred embodiment, the pharmaceutical composition further comprises at least one compound selected from the group consisting of 3-cyclohexane-1-methanol, camphene, 1,4-cycloprop-azulene, and phytol. The pharmaceutical composition includes these components in isolated or purified form

In accordance with another aspect of the invention, it is provided a method of preparing a composition having antimicrobial activity comprising extracting a plant material in an organic solvent, contacting the extracted material with a chromatographic separation system, and eluting from the chromatographic separation system with a mobile polar phase to obtain a composition. The plant material is obtained from *Mammea Americana*, *Marchantaceae polymorpha*, or *Callistemon citrinus*, and the composition has antimicrobial activity.

In accordance with yet another aspect of the invention, it is provided a method of inhibiting the growth of a mycobacterium, comprising administering a composition comprising a carrier and at least one compound selected from among cobaltocene-octomet, stigmastan, 3,5-diene, galoxolide, benzyl salicylate, eucalyptol, and α-pinene. The mycobacteria is *M. avium, M. bovis, M. intracellulare, M. kansaii, M. leprae, M. marinum, M. phlei, M. scrofulaceum, M. smegmatis, M. fortuitum, M. tuberculosis,* or *M. ulcerans*.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a Gas Chromatography/Mass Spectroscopy (GC/MS) analysis of an active fraction of *Mammea Americana*. The material was prepared by combination of 4

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HPLC runs, concentrated to 1 drop to which about 0.3 ml methanol was added. 10 µl were analyzed on GC/MS. The peaks were identified. The peak at 13 minutes is cobaltocene, 1,1',2,2',3,3',4,4'-octomet, the peak just past 30 minutes is stigmastan-3,5-dien, and the peak just past minute 36 is friedelin.

Figure 2 is a Gas Mass/Mass Spectroscopy (GC/MS) analysis of an active fraction of *Marchantaceae polymorpha*. The material was prepared by combination of 8 HPLC runs, concentrated to 1 drop to which about 0.3 ml methanol was added. 10 µl were analyzed on GC/MS. The peaks were identified. The peak at 13 minutes is cobaltocene, 1,1',2,2',3,3',4,4'-octomet.

Figure 3 is a Gas Mass/Mass Spectroscopy (GC/MS) analysis of an active fraction of *Callistemon citrinus*. The material was prepared by combination of 4 HPLC runs, concentrated to 1 drop to which about 0.3 ml methanol was added. 10 µl were analyzed on GC/MS. The peaks were identified. The peak just before 20 minutes is galoxolide, followed by a peak comprising benzyl salicylate.

DETAILED DESCRIPTION OF THE INVENTION

The invention was made possible by the identification and isolation of purified plant fractions and compounds which were shown to have antimicrobial activities. In accordance with one aspect of the invention, there is provided a method of preparing a composition having antimicrobial activity. The method comprises extracting a plant material in an organic solvent, contacting the extracted material to a chromatography separation system, and eluting the extract from the chromatography separation system with a mobile polar phase to obtain a composition which has antimicrobial activity. The plant material is from *Mammea Americana*, *Marchantaceae polymorpha*, or *Callistemon citrinus*.

Any part of the plant can be subjected to the extraction procedure. For example, seed, stem, leaf, flower, or plant sap may be the plant material which is extracted with an organic solvent. In accordance to a preferred embodiment, the plant material is leaf.

The organic solvent comprises, preferably, a polar solvent. The organic solvent can comprise one solvent or it can be a mixture of solvents. Buffers or salts may be added in a manner which is well known to an artisan skilled in the art. In accordance with one embodiment, the solvent is hydrogen bonding. The hydrogen bonding solvent can be, for example, a hydroxy, a carboxy, or an amine containing solvent. Preferably, the solvent includes an alcohol. In accordance with a more preferred embodiment the solvent is ethanol, and, in accordance with another preferred embodiment, the solvent is methylene chloride. The actual extraction procedures are well known in the art. For

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more pure). Most interestingly, despite the fact that the active compound was present in both extracts, there was little overlap between the compounds in the ethanol and the methylene chloride extracts (and for some plants no overlap). See Tables 2-4. This provided an indication that only one or very few compounds were responsible for the anti-microbial activity in each plant, and if more than one compound, the active compounds had very similar solubility properties, because they co purified in two different extraction systems.

Methylene chlorine extracts from *Mammea Americana*, *Marchantaceae polymorpha*, or *Callistemon citrinus* were separated on a HPLC system. Active fractions were identified. Active compounds were next identified. The compounds from *Mammea Americana* include cobaltocene-octomet, stigmastan-3,5-diene, and friedelin. In addition, consideration of the chemical properties of the compounds in the extract before fractionation indicates that one or more of α-caryophylene, β-caryophylene, caryophylene oxide, cyclododecane, acetic acid, and a terpene may also be present in trace (i.e. undetectable by GC/MS under the conditions described herein) quantities.

The compounds from *Marchantaceae polymorpha* include acetic acid, cobaltocene-octomet, and β-myrceane. In addition, consideration of the chemical properties of the compounds in the extract before fractionation indicates that hexadecanoic acid may also be present in trace quantities.

The compounds from *Callistemon citrinus* include galoxilide, benzyl salicylate, eucalyptol, and α-pinene. In addition, consideration of the chemical properties of the compounds in the extract before fractionation indicates that one or more of 3-cyclohexane-1-methanol, camphene, 1,4-cycloprop-azulene, or phytol may also be present in trace quantities.

In accordance with another aspect of the invention, a pharmaceutical composition comprising a pharmaceutical carrier and at least one compound selected from the group consisting of cobaltocene-octomet or stigmastan-3,5,-diene is provided. In accordance with a preferred embodiment, the pharmaceutical composition comprises cobaltocene-octomet, stigmastan-3,5-diene, and friedelin. The pharmaceutical composition may further comprise at least one compound selected from the group consisting of α-caryophylene, β-caryophylene, caryophylene oxide, friedelin, cyclododecane, acetic acid, and a terpene.

In accordance with another aspect of the invention, a pharmaceutical composition comprising a pharmaceutical carrier and at least one compound selected from the group consisting of galoxolide, benzyl salicylate, eucalyptol, and α-pinene is

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aforedescribed pharmaceutical compositions, the compounds or fractions of the present inventive method may be formulated as inclusion complexes, such as cyclodextrin inclusion complexes, or liposomes. Liposomes may serve to target the compounds or fractions to a particular tissue, such as lymphoid tissue or cancerous hepatic cells. Liposomes can also be used to increase the half-life of the compound or fraction. Many methods are available for preparing liposomes, as described in, for example, Szoka et al., *Ann. Rev. Biophys. Bioeng., 9,* 467 (1980), and U.S. Patent Nos. 4,235,871, 4,501,728, 4,837,028, and 5,019,369.

In accordance with another aspect of the invention, a method of inhibiting the growth of a mycobacterium, comprising administering a composition comprising a carrier and at least one compound selected from among cobaltocene-octomet, stigmastan, 3,5,-diene, galoxolide, benzyl salicylate, eucalyptol, and α-pinene is provided. The composition is appropriately formulated for storage and is destined for use as a cleaning agent. Accordingly, it may further comprise cleaning agents which would not interfere with the chemical activity of the above listed chemical agents. The formulation of such a cleaning solution and inclusion of general cleaning agents can easily be done by a skilled artisan, given theoretical chemistry considerations, and the stability and effectiveness of the solution can be easily tested by the skilled artisan. The testing would include a bio-assay such as the anti-microbial assays. The preparation and composition of such a cleaning solution is also within the scope of the invention.

The cleaning solution is active against at least mycobacteria or *E. coli.* Following is a listing of mycobacteria and sub groupings which are inhibited by the active compounds, the active fractions, and the methods of the invention. Mycobacterium group or complex or Mycobacterium species, and most preferred, a Mycobacterium complex such as *M. tuberculosis* (MTB) complex, *M. avium* (MAC) complex, MAIS complex and *M. fortuitum* complex, are inhibited, as well as fast growing and slow growing (i.e. less than 60 minutes average generation time in standard laboratory conditions) mycobacteria including specified and unspecified photochromogens, nonphotochromogens, scotochromogens, and especially *M. africanum, M. asiaticum, M. avium, M. bovis, M. bovis (BCG), M. butyricum, M. chelonae, M. duvalii, M. flavescens, M. fortuitum, M. gastri, M. gordonae, M. haemophilum, M. intracellulare, M. kansasii, M. leprae, M. lepraemurium, M. linda, M. lufu, M. marinum, M. malmoense, M. microti, M. mucoscum, M. nonchromogenicum, M. paratuberculosis, M. peregrinum, M. phlei, M. rhodochrous, M. scrofulaceum, M. shimoidei, M. simiae, M. smegmatis, M. szulgai, M. terrae, M. thermoresistable, M. triviale, M. tuberculosis, M. ulcerans, M. vaccae, M. xenopi,* and *serovats* thereof. *M. kansasii, M. marinum, M. simiae and M. asiaticum are*

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TABLE 5
SUMMARY OF FRACTIONATION, ZOI AND GC/MS FINDINGS REGARDING ANTI-MICROBIAL COMPOUNDS/FRACTIONS

	HPLC Fractions	Fraction Range*	*E-Coli* 25922 ZOI (mm)	*M. Smegmatis* ATCC 607 ZOI (mm)	Compounds Identified in Fraction	Additional Compounds
Mammea Americana L.C. *(Guttiferacea)*	1	0-2.5 min.	8	8		
	2	3.0-5.0 min.	13	10	Acetic acid, Cobaltocene-octomet, Stigmastan-3,5-diene, friedelin, terpene	α-caryophylene; β-caryophelene; caryophelene oxide; cyclododecaine
Marchantaceae polymorpha L.C. *(Marchantaceae)*	1	0-1.5 min.	14	13	Acetic acid, Cobaltocene-octomet β-myrceane	Hexadecanoic acid
	2	Insufficient				
Callistemon citrinus (Curtis) Skeels (Myrtaceae)	1	0-1.25 min.	8	6		
	2	1.25-2.7 min.	12	8		
	3	4.0-5.0 min.	13	12	Acetic acid Galoxilide Benzyl salicylate Terpene Eucalyptol α-pinene	3-cyclohexane-1-methanol camphene 1,4-cycloprop-azulene phytol
Streptomycin**			14	17		

*Based on retention times.

** Control consists of 10 micrograms streptomycin in the same solvent as the sample on the same 6 mm disc.

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WHAT IS CLAIMED IS:

1. A pharmaceutical composition comprising a pharmaceutical carrier and at least one compound in isolated or purified form selected from the group consisting of cobaltocene-octomet and stigmastan-3,5,-diene.

2. The pharmaceutical composition of claim 1, wherein the compound is cobaltocene-octomet.

3. The pharmaceutical composition of claim 1, wherein the compound is stigmastan-3,5,-diene.

4. The pharmaceutical composition of claim 1, comprising cobaltocene-octomet, stigmastan-3,5,-diene, and friedelin.

5. The pharmaceutical composition of claim 1, further comprising at least one compound selected from the group consisting of α-caryophylene, β-caryophylene, caryophylene oxide, friedelin, cyclododecane, acetic acid, and a terpene.

6. The pharmaceutical composition of claim 2, further comprising a terpene or acetic acid.

7. The pharmaceutical composition of claim 6, wherein said terpene is β-myrceane.

8. The pharmaceutical composition of claim 6, further comprising hexadecanoic acid.

9. A pharmaceutical composition comprising a pharmaceutical carrier and at least one compound selected from the group consisting of galoxolide and benzyl salicylate.

10. The pharmaceutical composition of claim 9, comprising galoxolide and benzyl salicylate.

11. The pharmaceutical composition of claim 9, further comprising at least one compound selected from the group consisting of 3-cyclohexane-1-methanol, camphene, 1,4-cycloprop-azulene, and phytol.

12. The pharmaceutical composition of claim 9, wherein the compound is galoxolide.

13. The pharmaceutical composition of claim 9, wherein the compound is benzyl salicylate.

14. The pharmaceutical composition of claim 9, wherein the compound is α-pinene.

15. A pharmaceutical composition comprising a pharmaceutical carrier and at least one compound selected from the group consisting of galoxolide, benzyl salicylate, eucalyptol and α-pinene, wherein the composition has antimycobacterial activity.

16. A method of preparing a composition having antimicrobial activity comprising extracting a plant material in an organic solvent,

contacting the extracted material with a chromatographic separation system, and

eluting the chromatographic separation system with a mobile polar phase to obtain a composition,

wherein the plant material is from *Mammea Americana* or *Callistemon citrinus*, and wherein the composition has antimicrobial activity.

17. The method of claim 16, wherein said plant is *Mammea Americana mamey Amarillo*.

18. A method of preparing a composition having antimicrobial activity comprising extracting a plant material in an organic solvent,

contacting the extracted material with a chromatographic separation system, and

eluting the chromatographic separation system with a mobile polar phase to obtain a composition,

wherein the plant material is from *Marchantia Polymorpha* and wherein the composition comprises at least one compound selected from among α-caryophylene, β-caryophylene, and caryophylene oxide.

19. The method of claim 16, wherein said plant is *Callistemon citrinus skeels*.

20. The method of claim 17, wherein said composition comprises at least one compound selected from the group consisting of cobaltocene-octomet, or stigmastan-3,5,-diene.

21. The method of claim 18, wherein said composition comprises α-caryophylene, β-caryophylene, and caryophylene oxide.

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22. The method of claim 19 wherein said composition comprises at least one compound selected from the group consisting of galoxolide, benzyl salicylate, and α-pinene.

23. The method of claims 16 or 18, wherein the organic solvent is methylene chloride.

24. The method of claim 16, wherein the antimicrobial activity is against a mycobacterium.

25. The method of claim 24, wherein the mycobacterium is *M. avium, M. bovis, M. intracellulare, M. kansaii, M. leprae, M. marinum, M. phlei, M. scrofulaceum, M. smegmatis, M. fortuitum, M. tuberculosis,* or *M. ulcerans*.

26. A method of inhibiting the growth of a mycobacterium, comprising administering a composition comprising a carrier and at least one compound selected from among cobaltocene-octomet, stigmastan, 3,5-diene, galoxolide, benzyl salicylate, eucalyptol, and α-pinene.

27. The method of claim 26, wherein said mycobacterium is *M. avium, M. bovis, M. intracellulare, M. kansaii, M. leprae, M. marinum, M. phlei, M. scrofulaceum, M. smegmatis, M. fortuitum, M. tuberculosis,* or *M. ulcerans*.

28. The method of claim 26, wherein said mycobacterium is in a mammal and said mammal is a human or a bovine.

29. The method of claim 28, wherein said composition is administered orally.

30. The pharmaceutical composition of claim 15, wherein the compound is eucalyptol.

31. The pharmaceutical composition of claim 15, wherein the compound is α-pinene.

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